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DEVELOPMENT OF SELECTED PLANTATIONS ON CROWN LANDS

(Established 1978, Assessed 1988)

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ABSTRACT

Sample plots established in 1983 in 1978 plantations were remeasured in 1988. Measurements from eighty eight sample plots were analysed to show the development of height and diameter of planted trees. Height, diameter and density measurements of natural conifer reproduction and competing hardwood vegetation were also recorded. Most of the plantations were overstocked to coniferous species. Approximately one quarter of the area sampled has excessive hardwood competition.

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INTRODUCTION

Plantation development monitoring with permanent sample plots commenced in 1980. In subsequent years most planted species and all forest licenses have been sampled. To date, plantations of Norway spruce and white pine have not been available for tenth year remeasurements. There have been 1688 sample plots established by 1988. Eighty eight sample plots established in 1983 on areas planted in 1978 were remeasured in 1988.

Primary use of the data collected will be to provide yield data for the wood supply models for N.B. forests.

All measurement data was obtained by the Timber Management Branch of the N.B. Department of Natural Resources and Energy.

METHODS

Permanent sample plots of 8 metre radius (201 m^3 area) were established in 1983 on areas planted in 1978. Procedures followed that suggested by Krause 1979[1]. Sample plots containing less than thirty one (31) planted trees were not remeasured in 1988.

Planted trees were identified with aluminum tags and tree height and diameter (dbh) were recorded. The height and diameter of natural conifer species more than 50 cm height were recorded. Diameters of trees less than 3.0 cm dbh were not recorded.

Hardwood species taller than one (1) metre were recorded on each 8 metre radius plot if fewer than 100 individuals were present. When more than 100 trees were present, hardwoods were tallied on 4 subplots of 1.0 metre radius. Trees larger than 3.0 cm dbh were also recorded on the 8.0 metre radius plot in the later case.

A soil pit was excavated near a sample plot to provide an estimate of soil drainage. A visual estimate of ground vegetation, slope and aspect were recorded for the area.

Drainage to planted trees was recorded both within and surrounding the sample plot according to its type, intensity and distribution. A more detailed account of the methods can be obtained from the field manual[2].

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[1]H. H. Krause, 1979. Development and yield projections in forest plantations, a proposal for growth monitoring in N.B. DNR plantations.

[2]Instructions for establishment of sample plots for 10th year plantation development assessment. Dept. of Natural Resources and Energy (1986).

RESULTS

The average diameter of planted trees was 4.79 cm ten years following plantation establishment. The corresponding tree height was 2.67 metres (Table 4). Jack pine outgrew other planted species attaining a height of 2.77 metres and a diameter of 5.19 cm in 10 years followed by black spruce at 2.24 metres and 3.96 cm dbh, red pine at 2.22 metres and 3.81 cm dbh and white spruce at 1.98 metres and 3.61 cm dbh (Table 4).

Jack pine achieved best development in the Carleton license attaining a height of 4.35 metres in ten years. Previous tenth year assessments also show that jack pine developes well in this area (see footnote).

Jack pine has performed consistently better than other planted conifers for the last four 10th year assessments (see footnote). The poorest height development in jack pine occurs on the Nepisiquit license, average height 2.02 metres (Table 4).

The best performance of black spruce occurred on the Restigouche-Tobique license 3.13 metres in 10 years and the poorest height growth was found on the Nepisiguit license. White spruce and red pine were sampled on the Restigouche-Tobique and the Queens' Charlotte license where they attained 3.13 metres and 2.22 metres respectively in 10 years (Table 4).

Comparison of height growth with 5th year plantation assessment data (Table 5) shows that jack pine paperpots attain the best height when comparing with black spruce paperpots.

Jack pine bare root stock showed better height development at both 5th and 10th year remeasurement than jack pine paperpots. Percent increase over the 5 year period was 60 percent better for 1978 plantations (Table 5). This apparent improvement however, has not been a consistent trend in the 1975, 1976 and 1977 data (see previous reports footnote).

Natural regeneration of coniferous species also contributes to overall softwood plantation density. In 1978 plantations, the affect of natural reproduction of balsam fir has had a negative impact on the plantations. Softwood stand densities were excessive on 85 percent of the sampled area (Table 6). Extensive cleaning operations will be required.

Hardwood competition in the plantations was excessive on twenty three percent of the sampled area (Table 6). This low number was probably a result of past measures to control hardwood competition.

Development of plantations on crown lands, planted 1976, assessed 1986. N.B. Dept. of Natural Resources & Energy (ISSN 0821-9427) and similar reports for 1975 to 1977 plantations.

SUMMARY

Crown land plantations established in 1978 and remeasured in 1988 were meeting minimum planted softwood density standards. Eighty five percent of the planted areas were overstocked with coniferous species.

Control of hardwood competition was adequate on most of the sampled area.

TABLE I
DEVELOPMENT OF SELECTED 1978
BARE ROOT PLANTATIONS ASSESSED 1988
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	HA.	PLANTED SOFTWOOD		ALL NATURAL SOFTWOOD			BALSAM FIR			NATURAL HARDWOOD			NATURAL HARDWOOD COMPETITION[2]		
			AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN[1]	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN.	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN.	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN.	AVG. HGT. (m)	AVG. DBH (cm)
203001678BP0	East Sabbies	698	3.68	5.4	3302	2.24	4.6	0	0.00	0.0	4516	2.09	4.4	60	5.26	4.6
306000378BP0	Mountain Brook Rd.	283	2.97	4.5	7865	2.03	4.8	1627	2.96	4.7	1187	1.85	3.7	590	3.75	3.7
306T00878BP0	Mountain Brook Rd.	410	4.26	5.5	6615	2.09	4.3	149	4.86	6.5	2006	1.60	0.0	0	0.00	0.0
406001878BP0	McDougall Lake	22	2.22	3.8	99	1.39	4.8	0	0.00	0.0	1393	1.63	3.4	149	2.95	3.4
409002278BP0	Napadogan	36	4.35	6.3	20591	1.26	3.5	0	0.00	0.0	9914	2.33	3.7	83	4.19	3.7

1 DENSITY IN TREES PER HECTARE.
2 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN SOFTWOOD AVERAGE HEIGHT.

TABLE 2
DEVELOPMENT OF SELECTED 1978
PAPER POT PLANTATIONS ASSESSED 1988
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	HA.	PLANTED SOFTWOOD AVG. HGT. (m)	PLANTED SOFTWOOD AVG. DBH (cm)	ALL NATURAL SOFTWOOD AVG. DEN.[1]	ALL NATURAL SOFTWOOD AVG. HGT. (m)	ALL NATURAL SOFTWOOD AVG. DBH (cm)	BALSAM FIR AVG. DEN.	BALSAM FIR AVG. HGT. (m)	BALSAM FIR AVG. DBH (cm)	NATURAL HARDWOOD AVG. DEN.	NATURAL HARDWOOD AVG. HGT. (m)	NATURAL HARDWOOD AVG. DBH (cm)	NATURAL HARDWOOD COMPETITION[2] AVG. DEN.	NATURAL HARDWOOD COMPETITION[2] AVG. HGT. (m)	NATURAL HARDWOOD COMPETITION[2] AVG. DBH (cm)
101T01278BP2	S E Charlo	442	2.25	3.8	1973	1.24	3.8	116	2.40	3.4	50	3.13	5.0	33	4.15	5.0
102T01578BP0	Browser Lake	27	2.02	3.6	1940	1.32	3.3	0	0.00	0.0	870	1.33	0.0	75	2.57	0.0
102T02878BP2	Nine Mile North	76	1.97	3.8	418	1.40	4.4	0	0.00	0.0	1442	1.61	4.0	458	2.17	4.0
102T02978BP0	Nine Mile North	15	2.11	3.5	3266	2.97	4.9	2122	3.62	4.8	3017	4.87	5.2	2752	4.93	5.2
102T03078BP0	Lawson Bk. S	57	1.69	3.3	1549	1.36	4.5	163	2.43	4.2	3226	2.61	4.1	2785	3.30	4.1
306T00378BP0	Mountain Bk. Rd.	20	3.30	5.3	2711	2.03	4.5	25	3.87	5.6	348	1.96	4.0	12	3.99	4.0
306T00478BP0	McKeen Brook	522	1.83	3.9	4053	1.45	4.1	0	0.00	0.0	261	1.55	0.0	50	2.38	0.0
306T00678BP0	Little Forks	110	3.02	4.8	6275	2.26	5.4	2230	2.41	5.4	572	2.23	3.3	99	2.88	3.3
306T00878BP1	Mountain Brook Rd.	410	3.54	5.1	3382	2.46	5.0	647	3.99	5.4	199	1.73	0.0	0	0.00	0.0
510T03678BP1	N Br Gounamitz R	158	2.58	4.1	1362	2.67	4.5	945	3.04	4.6	4414	2.11	3.1	833	2.98	3.1
510T03678BP0	N Br Gounamitz R	216	2.13	3.6	796	2.90	4.8	597	3.37	4.8	2810	2.62	3.0	1219	3.37	3.0

1 DENSITY IN TREES PER HECTARE.
2 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN SOFTWOOD AVERAGE HEIGHT.

TABLE 2 A
DEVELOPMENT OF SELECTED 1978
STYRO BLOCK PLANTATIONS ASSESSED 1988
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	HA.	PLANTED SOFTWOOD AVG. HGT. (m)	PLANTED SOFTWOOD AVG. DBH (cm)	ALL NATURAL SOFTWOOD AVG. DEN.[1]	ALL NATURAL SOFTWOOD AVG. HGT. (m)	ALL NATURAL SOFTWOOD AVG. DBH (cm)	BALSAM FIR AVG. DEN.	BALSAM FIR AVG. HGT. (m)	BALSAM FIR AVG. DBH (cm)	NATURAL HARDWOOD AVG. DEN.	NATURAL HARDWOOD AVG. HGT. (m)	NATURAL HARDWOOD AVG. DBH (cm)	NATURAL HARDWOOD COMPETITION[2] AVG. DEN.	NATURAL HARDWOOD COMPETITION[2] AVG. HGT. (m)	NATURAL HARDWOOD COMPETITION[2] AVG. DBH (cm)
406T03878BP0	West Long Lake	58	3.04	4.1	7460	1.45	4.4	99	3.35	4.2	796	2.46	4.5	149	3.51	4.5

1 DENSITY IN TREES PER HECTARE.
2 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN SOFTWOOD AVERAGE HEIGHT.

TABLE 3
SPECIES DEVELOPMENT OF SELECTED 1978
PLANTATIONS ASSESSED IN 1988
10TH YEAR REPORT

SILVICULTURE TREATMENT NO.	AREA (ha.)	PLANTED SOFTWOOD				METHOD OF SITE PREPARATION
		SPECIES	STOCK	HEIGHT(m)	DBH(cm)	
101T01278BP2	442	bS	PP	2.25	3.8	Shark Fin Barrels
102T01578BP0	27	jP	PP	2.02	3.6	Burn
102T02878BP2	76	bS	PP	1.97	3.8	Finnish Plow
102T02978BP0	15	bS	PP	2.11	3.5	Finnish Plow
102T03078BP0	57	bS	PP	1.69	3.3	Brackie
203001678BP0	698	jP	BR	3.68	5.4	Finnish Plow
306000378BP0	283	jP	BR	2.97	4.5	Shark Fin Barrels
306T00378BP0	20	jP	PP	3.30	5.3	Shark Fin Barrels
306T00478BP0	522	jP	PP	1.83	3.9	Finnish Plow
306T00678BP0	110	jP	PP	3.02	4.8	Shark Fin Barrels
306T00878BP1	410	jP	PP	3.54	5.1	Shark Fin Barrels
306T00878BP2		jP	BR	4.26	5.5	Shark Fin Barrels
406001878BP0	22	rP	BR	2.22	3.8	Disc Trencher
406T03878BP0	58	bS	SB	3.04	4.1	Shark Fin Barrels
409002278BP0	36	jP	BR	4.35	6.3	No-site Preparation
510T03678BP1	158	bS	PP	3.13	4.1	Anchor Chains
		wS	PP	1.89	3.6	Anchor Chains
510T03678BP2	216	wS	PP	2.13	3.6	Anchor Chains

PP = paper pot; BR = bare root; SB = styro block
jP = jack pine; bS = black spruce; wS = white spruce; rP = red pine

TABLE 4
LICENSE AVERAGES OF SELECTED 1978 PLANTATIONS
TEN YEARS AFTER PLANTING

LICENSE	STOCK TYPE	PLANTED SOFTWOOD HGT. (M)	PLANTED SOFTWOOD D.B.H. (CM)	BLACK SPRUCE HGT. (M)	BLACK SPRUCE D.B.H. (CM)	WHITE SPRUCE HGT. (M)	WHITE SPRUCE D.B.H. (CM)	JACK PINE HGT. (M)	JACK PINE D.B.H. (CM)	RED PINE HGT. (M)	RED PINE D.B.H. (CM)
UPSALQUITCH	PP	2.25	3.82	2.25	3.82	-	-	-	-	-	-
	ALL	2.25	3.82	2.25	3.82	-	-	-	-	-	-
NEPISIQUIT	PP	1.89	3.60	1.88	3.61	-	-	2.02	3.56	-	-
	ALL	1.89	3.60	1.88	3.61	-	-	2.02	3.56	-	-
LOWER MIRAMICHI	BR	3.68	5.43	-	-	-	-	3.68	5.43	-	-
	ALL	3.68	5.43	-	-	-	-	3.68	5.43	-	-
QUEEN'S CHARLOTTE	BR	3.15	4.82	-	-	-	-	3.36	4.97	2.22	3.81
	PP	2.85	4.95	-	-	-	-	2.85	4.95	-	-
	SB	3.04	4.07	3.04	4.07	-	-	-	-	-	-
	ALL	2.97	4.86	3.04	4.07	-	-	3.03	4.96	2.22	3.81
CARLETON	BR	4.35	6.32	-	-	-	-	4.35	6.32	-	-
	ALL	4.35	6.32	-	-	-	-	4.35	6.32	-	-
RESTIGOUCHE-TOBIQUE	PP	2.48	4.03	3.13	4.15	1.98	3.61	-	-	-	-
	ALL	2.48	4.03	3.13	4.15	1.98	3.61	-	-	-	-
PROVINCE	BR	3.47	5.31	-	-	-	-	3.63	5.42	2.22	3.81
	PP	2.38	4.43	2.21	3.95	1.98	3.61	2.77	4.89	-	-
	SB	3.04	4.07	3.04	4.07	-	-	-	-	-	-
	ALL	2.67	4.79	2.24	3.96	1.98	3.61	2.77	5.19	2.22	3.81

Stock Types - BR = Bare Root, PP = Paper Pot, SB = Styro Block

TABLE 5
COMPARISON OF HEIGHT GROWTH (m)
OF FIFTH AND TENTH YEAR ASSESSMENTS
BY SPECIES AND STOCK TYPE
FOR SELECTED 1978 PLANTATIONS

ASSESSMENT PERIOD	BLACK SPRUCE			WHTIE SPRUCE		JACK PINE		RED PINE
	BR	PP	SB	BR	PP	BR	PP	BR
5 yrs.	0.58	0.82	-	-	-	1.19	1.15	1.00
10 yrs.	-	2.21	3.04	1.98	-	3.63	2.77	2.22
PERCENT INCREASE	-	169	-	-	-	205	141	122

TABLE 6

1978 PLANTATION PERFORMANCE BY LICENSE
TEN YEARS AFTER PLANTING

LICENSE	HECTARES SAMPLE	PERCENT OF AREA WITH SOFTWOOD[1] DENSITY 1500 - 3000 TREES PER HECTARE		PERCENT OF AREA WITH HARDWOOD COMPETITION[2] MORE THAN 500 TREES PER HECTARE
Upsalquitch	442	0	0	0
Nepisiguit	175	0	43	41
Lower Miramichi	698	0	0	0
Queen's Charlotte	1 425	100	2	20
Carleton	36	100	0	0
Restigouche-Tobique	374	100	100	100
TOTAL	3 150	100		23

[1]Softwood assumes a minimum of 1 500 planted trees plus other conifers.
[2]Competition includes all hardwoods equal to or taller than softwood average height.